INSTRUCTION MANUAL

B+K PRECISION 2800

3½-DIGIT DIGITAL MULTIMETER

B+K PRECISION

Product of DYNASCAN CORPORATION
6460 W. Cortland St., Chicago, Illinois 60635

INSTRUCTION MANUAL

FOR

MODEL 2800

3½-DIGIT DIGITAL MULTIMETER

DYNASCAN CORPORATION
6460 West Cortland Street
Chicago, Illinois 60635

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INTRODUCTION

The **B & K-Precision** Model 2800 Digital Multimeter is a significant contribution to the instrumentation market. High performance at low cost has been engineered into this instrument to make available to engineers, technicians, maintenance and service personnel, and training institutions a digital multimeter that surpasses the performance of existing analog meters and yet is competitively priced.

The basic instrument has been designed for maximum simplicity of operation and minimum error of reading. Features include automatic offset correction ("Auto-Zero") and automatic polarity switching ("Auto-Polarity"), as well as simple range interpretation and high resolution.

The basic design features of this instrument make it an ideal replacement for existing multimeters and FET/VOM's. The 2800 measures DC and AC voltage, current and ohms. It has high input impedance (10 megohms) on all voltage ranges, and a wide resistance measurement range (200 ohms full scale to 20 megohms full scale). In addition to providing equivalent functions and ranges, the inherent accuracy of this instrument provides a significant margin of improved performance over analog multimeters. The proven stability of dual-slope integration is coupled to the precision of ratio-trimmed resistor networks and advanced L.S.I. technology, while the isolation allowed by battery operation makes the Model 2800 less susceptible to common-mode errors and noise than comparable AC-powered meters. The specifications shown are conservative; most units perform much better than the limits indicated.

A HI/LO ohms feature, generally not available on digital multimeters, permits making in-circuit resistance measurements at voltage levels below the conduction threshold of semiconductors.

The overload protection system was designed to provide maximum protection of the instrument with minimum user inconvenience, in the event of extreme overload accidents. The only part that may be damaged by most common mistakes is the fuse, which can be replaced through the front panel.

SPECIFICATIONS

DC VOLTAGE

Ranges	±0-1V, 10V, 100V, 1000V.
Overrange (Full Scale)	100% on all ranges except ±1500V max.
Accuracy, @ +25°C, ±1°C	±0.5% of reading, ±0.25% of full scale, ±1 LSD on 1, 10, 100V ranges. ±1% of reading, ±0.33% of full scale, ±1 LSD on 1000V range.
Input Impedance	10 megohms.
Polarity Indication	Automatic; minus sign shown, plus sign implied.
Circuit Protection, All Voltage Ranges	1500 VDC or DC+AC peak.

AC VOLTAGE

(Average-reading circuitry calibrated to read RMS value of pure sine wave).

Ranges	0-1V, 10V, 100V, 1000V.
Overrange (Full Scale)	100% on all ranges except 1000V RMS max.
Accuracy, @ +25°C, ±1°C	±1% of reading, ±0.5% of full scale, ±1 LSD on 1, 10, 100V ranges. ±2% of reading, ±1% of full scale, ±1 LSD on 1000V range.
Frequency Response	50-400 Hz.
Input Impedance	10 megohms.
Circuit Protection, All Voltage Ranges	1500 VDC or DC+AC peak.

DC CURRENT

Ranges	±0-1mA, 10mA, 100mA, 1000mA.
Overrange (Full Scale)	100% on all ranges.
Voltage Drop (Measured at Instrument Terminals)	Nominal 200mV full scale on 1mA, 10mA, 100mA ranges. Nominal 700mV full scale on 1000mA range.
Accuracy @ +25°C, ±1°C	±1% of reading, ±0.5% of full scale, ±1LSD on 1, 10, 100mA ranges. ±2% of reading, ±0.5% of full scale, ±1LSD on 1000mA range.
Polarity Indication	Automatic; minus sign shown, plus sign implied.
Circuit Protection, All Ranges	Fuse and diodes. Fuse externally accessible.

AC CURRENT

Ranges	0-1mA, 10mA, 100mA, 1000mA.
Overrange (Full Scale)	100% on all ranges.
Voltage Drop (Measured at Instrument Terminals)	Nominal 200mV RMS full scale on 1mA, 10mA, 100mA ranges. Nominal 700mV RMS full scale on 1000mA range.
Accuracy @ +25°C, ±1°C	±1% of reading, ±0.5% of full scale, ±1 LSD on 1, 10, 100mA ranges. ±2% of reading, ±0.5% of full scale, ±1 LSD on 1000mA range.
Frequency Response	50-400 Hz.
Circuit Protection, All Ranges	Fuse and diodes. Fuse externally accessible.

RESISTANCE

Ranges

0-100Ω, 1KΩ, 10KΩ, 100KΩ, 1000KΩ, 10MΩ.

Overrange (Full Scale)

100% on all ranges.

Polarity

Plus (+) jack is positive for all ranges.

Accuracy @ +25°C, ±1°C

±1% of reading, ±0.5% of full scale, ±1 LSD on 100Ω; 1, 10, 100, 1000KΩ ranges.

±1.5% of reading, ±0.5% of full scale, ±1 LSD on 10MΩ range.

Test Currents

Range	Current	Full Scale Voltage
100Ω	1mA	0.2V
1KΩ	1mA	2.0V
10KΩ	10μA	0.2V
100KΩ	10μA	2.0V
1000KΩ	100nA	0.2V
10MΩ	100nA	2.0V

Maximum Open Circuit Voltage

8V.

Circuit Protection

+1000V to −450 VDC or 300V RMS AC continuous, ±1000 VDC or AC momentary.

GENERAL

Operating Temperature

15°C to +35°C.

Overrange Indication

The display will flash 1999 when the input exceeds full scale of the range selected.

Settling Time, All Ranges and Functions

Less than one second, typically 0.7 second.

Power Source

4 "C" size batteries, Ni-Cad, Alkaline or Carbon Zinc, with provision for charger/converter. (NOTE: Batteries and charger/converter are not supplied).

Battery Life

Better than 30 hrs. (with Alkaline batteries, continuous use).

Accessories (Included)	2 test leads.
Accessories (Optional)	BC-28 AC adapter/battery charger. BP-28 rechargeable batteries. LC-28 carrying case. MS-28 wire tilt stand. PR-21 isolation/direct probe (aids DC measurements in presence of RF). PR-23 RF detector probe, 15 kHz to 250 MHz. PR-28 high-voltage probe, 40 KV DC max. (20KV AC).
Dimensions (WxHxD)	4-3/8 x 6-3/8 x 2" (11 x 16 x 5cm).
Weight:	2 lbs. (0.9kg).

CONTROLS AND FEATURES
(Refer to Fig. 1)

FUNCTION SWITCH. Selects the type of measurement to be performed.

(+) JACK. "Hot" input jack. In voltage measurements the test lead connected to this jack is normally applied to the potential point in the circuit most removed from signal ground or earth ground.

(–) JACK. Common connection to the instrument input; it should be connected to ground or a low impedance point when measuring voltage.

FUSE HOLDER. Permits easy access to protection Fuse. See MAINTENANCE section.

HI/LO OHMS INDICATION WINDOW. Shows H or L, depending on the range selected. (Significant in resistance measurements only.)

POWER SWITCH. Turns unit ON or OFF.

RANGE SWITCH. Selects the desired range for the measurement.

BATT. TEST. Test point at right side of case allows battery test, using the (+) test probe.

CONVERTER/CHARGER JACK. Provides rapid connection to converter/charger, and is used with BATT. TEST when checking condition of batteries.

MINUS SIGN. A minus (–) indication will be displayed on DC Volts or DC current for a negative voltage or current respectively. The positive (+) sign is implied and not displayed. **NOTE:** The minus sign may flash with zero reading in any function.

NUMERICAL READOUTS. 3½ digit display. Except for ½ digit, each display indicates numerals from "0" to "9". Also serves as overrange indicator by flashing all displays when input exceeds value of 1999.

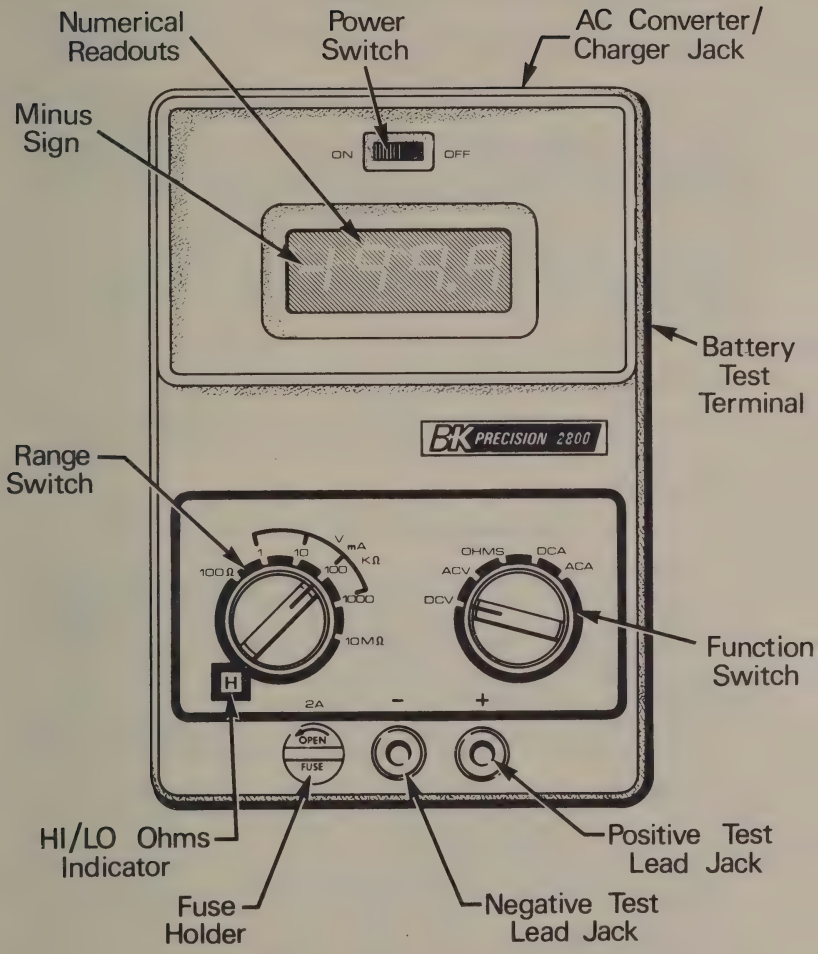


Fig. 1. Controls and indicators.

OPERATION

1. BATTERY OPERATION WITH NON-RECHARGEABLE CARBON-ZINC OR ALKALINE CELLS

The 2800 will operate from 4 "C" size flashlight batteries. Install as shown in MAINTENANCE section.

AC-POWERED CHARGER/CONVERTER USE

B & K-Precision Model BC-28 is recommended. The charger/converter is designed for use with "C" size Ni-Cad batteries. It plugs into the jack located as shown in Fig. 1. For proper operation, the 2800 *must have* Ni-Cad batteries installed to use the charger/converter.

WARNING: DO NOT ATTEMPT TO USE THE AC CHARGER/ CONVERTER TO CHARGE CARBON-ZINC OR ALKALINE BATTERIES.

2. PREPARATION AND CHECK

a. Plug the red test lead into the (+) jack, and the black test lead into the (–) jack.

b. Turn unit on.

c. Turn the FUNCTION switch to OHMS.

d. Without a resistance connected across the test leads, the overrange indication should occur, causing the display to flash. Shorting the test leads should produce a zero reading, except on lowest range where a few tenths of an ohm should be seen due to fuse and leads resistance.

e. Return FUNCTION switch to ACV or DCV and RANGE switch to 1000V. It is a good practice to leave the instrument in this position when not in use to prevent accidental overloads.

NOTE: Minus sign may flash with zero reading in any function.

SAFETY PRECAUTIONS

A certain amount of danger is always present when working on electrical equipment and therefore, the user is cautioned to always familiarize himself as much as possible with the equipment to be tested, before any work is performed. It should be kept in mind that high voltages often appear at unexpected points in defective equipment.

When testing high voltage circuits, develop the habit of keeping one hand in your pocket to minimize the hazard of accidental shock.

It is also important to have a properly insulated floor or floor covering to stand on while taking measurements. Be particularly careful to avoid contact with nearby objects which could provide a ground return path.

It is good practice to *remove operating power* before connecting test leads. An isolation transformer always should be used in equipment having the chassis tied to one side of the AC power line.

3. BATTERY TEST

a. Set to 10 VDC range. Insert positive (+) test lead probe into battery test terminal on right *SIDE* of case, then measure voltage at the *REAR* AC Converter/Charger jack mounting nut. *SIDE-REAR* = DIFFERENCE.

BATTERY TYPE	DIFFERENCE	CONDITION
ZINC-CARBON OR ALKALINE	4.20 or greater	Batteries OK
	Less than 4.20	Replace
NI-CAD	Less than 4.20	Recharge

NOTE

Discharge of Ni-Cad batteries below the reading of 4.20 will reduce the rechargeable life of the batteries.

Remove discharged carbon-zinc or alkaline batteries immediately to prevent leakage damage to the case.

b. Replacement of batteries. Loosen the captive screw on the back cover (Fig. 3). Replace with "C" cells. Although carbon-zinc batteries can be used, alkaline or nickel cadmium (rechargeable) are recommended (see MAINTENANCE section for replacement battery type numbers). The battery polarity is marked in the battery holder. Replace cover and tighten screw.

c. If desired, the battery with the least remaining charge can be identified without using another voltmeter. Set to 10 VDC range. Loosen the captive screw to remove the back cover. Hold the batteries in place while touching positive (+) test lead probe to each of the battery ends in turn and write down each reading. The difference between adjacent readings is that battery's voltage.

TABLE 1

INTERPRETATION OF DIGITAL DISPLAY READINGS

TO MEASURE	SET FUNCTION SWITCH	SET RANGE SWITCH	DISPLAY FULL SCALE	READINGS ARE IN:	RESOLUTION**
DC VOLTS					
0-2V	DCV	1V	1.999	Volts	1mV
0-20V		10V	19.99	Volts	10mV
0-200V		100V	199.9	Volts	100mV
0-1500V*		1000V	1500*	Volts	1.0V
AC VOLTS					
0-2V	ACV	1V	1.999	Volts	1mV
0-20V		10V	19.99	Volts	10mV
0-200V		100V	199.9	Volts	100mV
0-1000V*		1000V	1000*	Volts	1.0V
DC CURRENT					
0-2mA	DCA	1mA	1.999	mA	1μA
0-20mA		10mA	19.99	mA	10μA
0-200mA		100mA	199.9	mA	100μA
0-2Amp		1000mA	1999	mA	1mA
AC CURRENT					
0-2mA	ACA	1mA	1.999	mA	1μA
0-20mA		10mA	19.99	mA	10μA
0-200mA		100mA	199.9	mA	100μA
0-2Amp		1000mA	1999	mA	1mA
OHMS					
0-200Ω	OHMS	100Ω	199.9	Ohms	0.1Ω
0-2000Ω		1kΩ	1.999	Kilohms	1Ω
0-20kΩ		10kΩ	19.99	Kilohms	10Ω
0-200kΩ		100kΩ	199.9	Kilohms	100Ω
0-2MΩ		1000kΩ	1999	Kilohms	1kΩ
0-20MΩ		10MΩ	19.99	Megohms	10kΩ

NOTES

* *Do not exceed* input levels of 1500V (AC *peak* + DC, or DC).

** Resolution indicates the change in the measured value that is required to shift the least significant (right hand) digit, one count.

TABLE 1 is provided as an aid to operation of the Model 2800 and, in addition, provides interpretation of the displays obtained. Note that the decimal location changes with the position of the RANGE switch. The significance of the decimal location must be known to assure proper interpretation of readings obtained.

4. DC VOLTAGE MEASUREMENTS

a. Set FUNCTION switch to the DCV position.

b. Set RANGE switch as required for the voltage amplitude to be measured. If the magnitude of the voltage is not known, set the RANGE switch to the highest position and reduce the settings as required to obtain a satisfactory reading.

c. If the voltage exceeds that of the range selected, the overrange indication will operate and the digits will flash. Select a higher voltage range.

5. AC VOLTAGE MEASUREMENTS

a. Place the FUNCTION switch in the ACV position.

b. Set the RANGE switch to the desired voltage. If the voltage exceeds that of the range selected, the overrange indication will operate and the digits will flash. Select a higher voltage.

6. RESISTANCE MEASUREMENTS

CAUTION

Do not attempt to measure resistance in a circuit in which the power is applied. Remove the power and make sure that all capacitors are discharged before attempting in-circuit resistance measurements.

a. OUT-OF-CIRCUIT:

(1) Set the FUNCTION switch to the OHMS position.

(2) Set the RANGE switch to the desired position.

(3) If the resistance value being measured exceeds the value of the range selected, the overrange circuitry is energized, causing the digits to flash. Select a higher range.

(4) In the highest ohms ranges, a slight instability of the reading may be observed if unshielded test leads are used or if the leads are moving. This is due to pickup of radiation by the high impedance low current circuit.

b. IN-CIRCUIT:

(1) The Model 2800 alternates between LO and HI ohms ranges. Conventional resistance measurements can be performed on all ranges. The LO ohms positions limit the maximum test voltage developed across the measured resistance to 0.2 volt with a full range reading. This low voltage permits accurate measurements of in-circuit resistances shunted by semiconductor junctions.

The applied test voltage is proportional to the resistance reading observed, varying from zero with the test leads shorted to 0.2 volt for a full-range reading. For example, in the 100Ω range with a resistance reading of 50.0 ohms, the voltage developed across the resistance under test is .05 volt.

When using the HI ohms positions, a full-range voltage of 2 volts is developed across the measured resistance. Again, the voltage developed across the measured resistance is proportional to the resistance reading observed. Reversing the leads will result in the same reading (within 1%) if there is no shunting by a semiconductor, and is a good quick check that the accuracy of the measurement is not being affected by semiconductors.

c. OUT-OF-CIRCUIT SEMICONDUCTOR TESTS:

In addition to conventional resistance measurements, the HI ohms ranges can be used to verify that a semiconductor junction is good by checking the front-to-back ratio.

(1) Select the 1 kΩ range.

(2) Remove device from circuit.

(3) Connect the test leads to the device (e.g., diode, base-emitter or base-collector junction) and then reverse the lead connections. Observe the meter reading for both conditions.

TEST RESULT	CONDITION
(a) Overrange, both polarities	Junction open
(b) Zero or low reading, both polarities	Junction shorted
(c) Overrange in one direction and in-range reading in the other	Junction probably good

(4) The in-range reading of Step (c) can be used to determine whether the device under test is silicon or germanium. A reading of .400 to .700 indicates the device is silicon. An indication of .100 to .300 indicates the device is germanium.

7. DC CURRENT MEASUREMENTS

a. Place the FUNCTION switch in the DCA position.

b. Place the RANGE switch in the desired current range position. Always set the RANGE switch to the highest position if the magnitude of current to be measured is not known.

CAUTION

Use care in making current measurements. Make sure that the meter is connected *in series* with the load in which the current is to be measured. Never connect the meter across a voltage source with the FUNCTION switch set for current. Doing so may either blow the overload protection fuse or damage the equipment under test.

When connecting the multimeter to read current, first remove power to the circuit. The following rules will insure that the proper current polarity is indicated.

(1) When inserting the multimeter between the positive side of the power source and the load, connect the positive lead to the power source and the negative lead to the load.

(2) When inserting the multimeter between the negative side of the power source and the load connect the negative lead to the power source and the positive lead to the load.

c. Apply power and read current.

d. If the polarity of the current being measured is negative, the polarity sensing circuit will be energized, and the value displayed will be preceded by a minus (–) sign.

e. If the magnitude of the current being measured exceeds that indicated on the RANGE switch the overrange circuitry will operate, causing the digits to flash. When this occurs, immediately remove power from the circuit under test and select a higher current range before proceeding further.

NOTE

Current ranges are fuse-protected. If inoperative on all ranges, refer to MAINTENANCE section for fuse replacement.

8. AC CURRENT MEASUREMENTS

a. Set the FUNCTION switch to the ACA position.

b. Set the RANGE switch to the desired position. If in doubt about

the magnitude of the current to be measured, use the highest current range and then adjust the RANGE switch as required to obtain a satisfactory reading.

c. When connecting the multimeter for current measurements, remove the power from the circuit being tested while the connections are being made. Reapply the power and read current.

d. If the magnitude of the current being measured exceeds the range selected, the overrange circuitry will operate, causing the digits to flash. When this occurs immediately remove power from the circuit under test and select a higher current range before proceeding further.

NOTE

Current ranges are fuse-protected. If inoperative, refer to MAINTENANCE section on replacement.

THEORY OF OPERATION

The basic functions of the 2800 can best be described by referring to the block diagram, Fig. 2.

The Model 2800 operates by converting the various types of input signals into a scaled DC voltage which is then transformed into a digital readout by the logic and display circuits (IC's 2, 3 and 4).

Voltage inputs are applied across the 10 megohm voltage divider (resistor network RN 1). A fraction of that voltage is selected by the range switch and, if set to the ACV function, is passed through a capacitively coupled AC-to-DC converter before it goes to the high impedance buffer (in IC 2). The remainder of the basic DC voltmeter, which has a range of zero to ± 2 volts in this mode, consists of an automatic offset correction (auto-zero) circuit, a dual-slope integrator, and the digital processing and multiplexing devices. The reference for the meter is derived from a highly stable zener diode (D5) with fixed current drive.

Resistance measurements are made by generating a precision constant current (controlled by IC 5) which develops a DC voltage across the measured resistor proportional to its resistance. The signal is then applied to the buffer and processed as for voltage measurements with the exception that, when a "low ohms" range is selected (such as the 10kΩ range when set to ohms function), the "gain" of the integrator stage is multiplied by 10 and a small test current is used so a full scale display is obtained with only 0.2 volts developed across the resistor being checked.

For current measurements, the input is passed through one of four small shunt resistances (100 through 0.1 ohms) which drop up to 0.2 volts for a full scale reading. This voltage is applied to the buffer and the integrator in its gain of 10 mode.

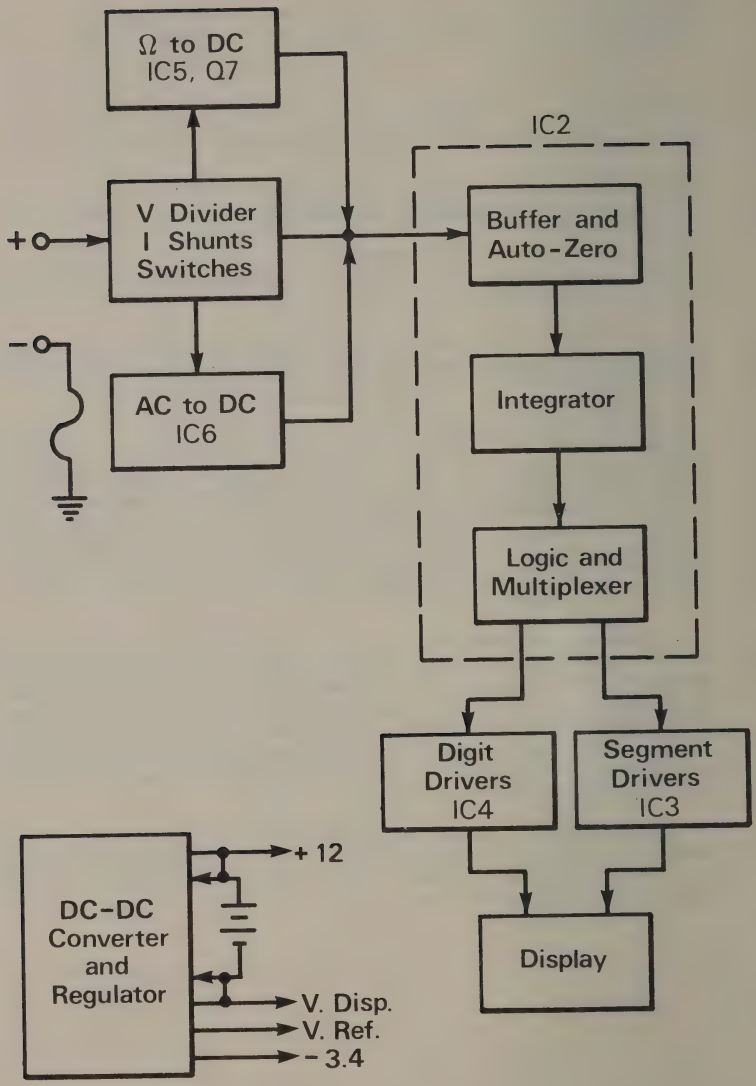


Fig. 2. Block diagram.

CALIBRATION PROCEDURE

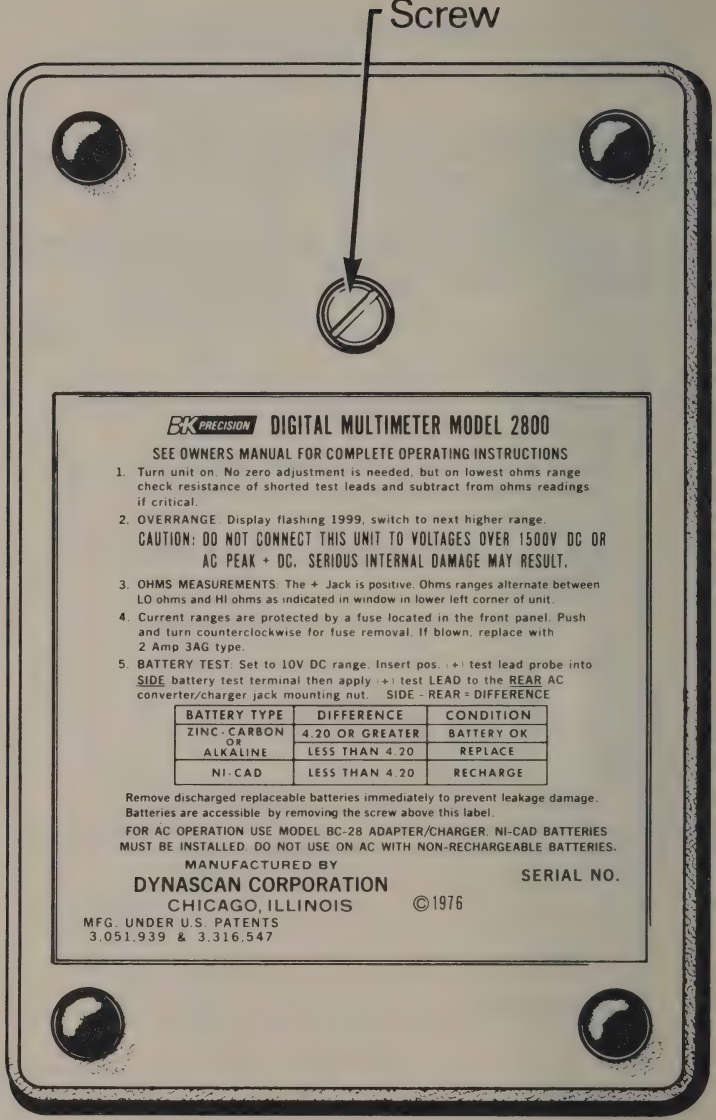
(Refer to Fig 4 for Location of Internal Adjustments)

The instrument should not require calibration unless repairs have been made that change the factory calibration. Prior to calibration the instrument should be checked for proper operation of all functions and for damage from physical abuse or excessive overloads.

The following procedure requires a low-impedance constant-voltage source of 0.1% accuracy or better. Use of sources with less accuracy reduces the accuracy of the instrument. Remove back and refer to Fig. 4.

It is important that this procedure is followed in the order given below:

1. Set unit to DCV 1V range.
2. Apply +1.9 volts to input and adjust R31 for a reading of 1.900.
3. Set unit to ACV.
4. Apply 1.9 volts RMS sine wave (any frequency between 50 and 400 Hz) and adjust R33 for a reading of 1.900.
5. Set unit to OHMS.
6. Connect 1.9k ±0.1% to inputs and adjust R32 for a reading of 1.900.


Screw
B&K PRECISION DIGITAL MULTIMETER MODEL 2800
SEE OWNERS MANUAL FOR COMPLETE OPERATING INSTRUCTIONS
1. Turn unit on. No zero adjustment is needed, but on lowest ohms range check resistance of shorted test leads and subtract from ohms readings if critical.
2. OVERRANGE. Display flashing 1999, switch to next higher range.
CAUTION: DO NOT CONNECT THIS UNIT TO VOLTAGES OVER 1500V DC OR AC PEAK + DC. SERIOUS INTERNAL DAMAGE MAY RESULT.
3. OHMS MEASUREMENTS. The + Jack is positive. Ohms ranges alternate between LO ohms and HI ohms as indicated in window in lower left corner of unit.
4. Current ranges are protected by a fuse located in the front panel. Push and turn counterclockwise for fuse removal. If blown, replace with 2 Amp 3AG type.
5. BATTERY TEST. Set to 10V DC range. Insert pos. (+) test lead probe into SIDE battery test terminal then apply (+) test LEAD to the REAR AC converter/charger jack mounting nut. SIDE - REAR = DIFFERENCE
BATTERY TYPE | DIFFERENCE | CONDITION
ZINC-CARBON OR ALKALINE | 4.20 OR GREATER | BATTERY OK
LESS THAN 4.20 | REPLACE
NI-CAD | LESS THAN 4.20 | RECHARGE
Remove discharged replaceable batteries immediately to prevent leakage damage. Batteries are accessible by removing the screw above this label.
FOR AC OPERATION USE MODEL BC-28 ADAPTER/CHARGER. NI-CAD BATTERIES MUST BE INSTALLED. DO NOT USE ON AC WITH NON-RECHARGEABLE BATTERIES.
MANUFACTURED BY
DYNASCAN CORPORATION
CHICAGO, ILLINOIS
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SERIAL NO.
MFG. UNDER U.S. PATENTS
3,051,939 & 3,316,547

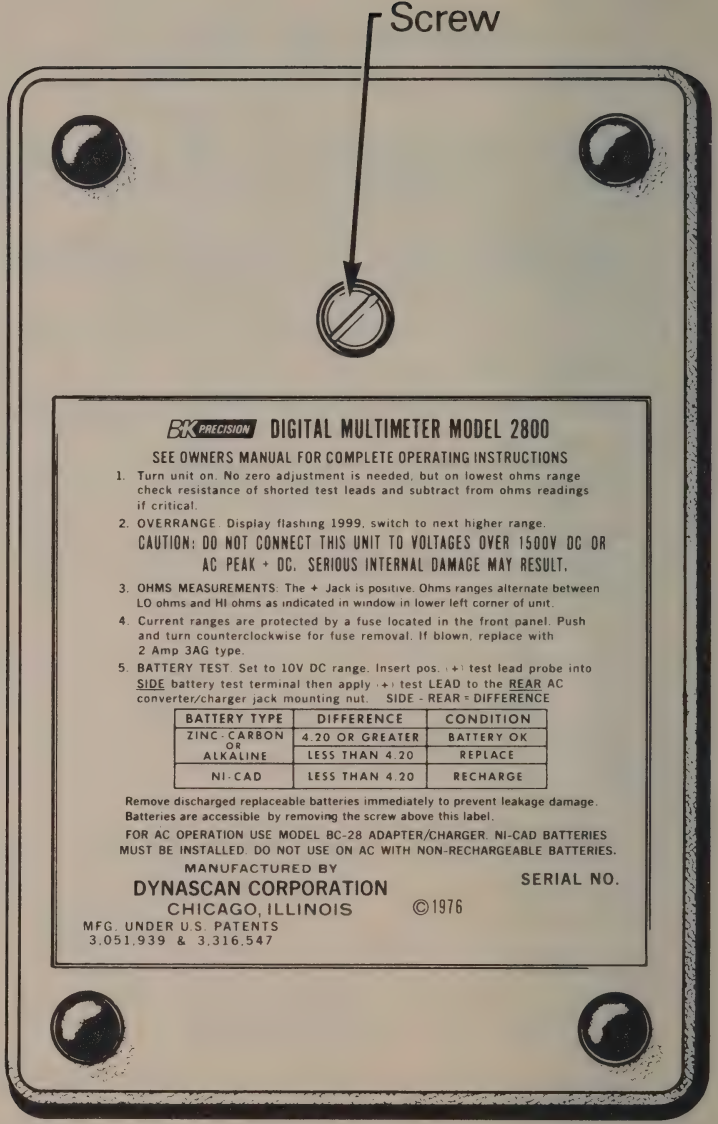
Fig. 3. Bottom view.

B & K-PRECISION MODEL 2800 PARTS LIST

488-199-9-002

SCHEMATIC SYMBOL	DESCRIPTION	DYNASCAN PART NO.
	RESISTORS	
R24	0.098Ω, ½% Preformed Wirewound	004-125-9-001
R25	0.9Ω, 1w, ½% Preformed Wirewound	004-160-9-001
R26	9Ω, ½w, 1% Preformed Metal Film	011-123-9-001
R27	90Ω, ½w, ½% Preformed Metal Film	011-089-9-001
R29	Special, High-Voltage Current Limiter	004-163-9-001
R30, 38	470KΩ, ½w, 5% Preformed Metal Film	011-102-8-474
R31	Trimpot, 1KΩ	008-247-9-001
R32	Trimpot, 2.5KΩ	008-269-9-001
R33	Trimpot, 500Ω	008-266-9-001
	NETWORKS	
RN-1	Resistor Network, Input	012-006-9-001
RN-2	Resistor Network	012-013-9-001
RN-3	Resistor Network	012-014-9-001
	CAPACITORS	
C1, 10	.01μF, 25V, Pin Lead Disc Ceramic	020-139-9-001
C3	220μF, 25V, +100, −10%, Electrolytic	022-146-9-001
C4, 15	15μF, 10V, 20% P. F. Tantalum	027-009-9-001
C5,	15μF, 20V, 20% P. F. Tantalum	027-016-9-001
C6	47μF, 6.3V, 20% P.F. Tantalum	027-013-9-001
C7	.047μF, 100V, 20% P. F. Polyester	025-094-9-001
C8, 9 11, 17	0.1μF, 100V, 20% P. F. Polyester	025-109-9-001

COMPOSITE
499-118-9-001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4. Current ranges are protected by a fuse located in the front panel. Push and turn counterclockwise for fuse removal. If blown, replace with 2 Amp 3AG type.
5. BATTERY TEST. Set to 10V DC range. Insert pos. (+) test lead probe into SIDE battery test terminal then apply (+) test LEAD to the REAR AC converter/charger jack mounting nut. SIDE - REAR = DIFFERENCE
BATTERY TYPE | DIFFERENCE | CONDITION
ZINC-CARBON OR ALKALINE | 4.20 OR GREATER | BATTERY OK
ZINC-CARBON OR ALKALINE | LESS THAN 4.20 | REPLACE
NI-CAD | LESS THAN 4.20 | RECHARGE
Remove discharged replaceable batteries immediately to prevent leakage damage. Batteries are accessible by removing the screw above this label.
FOR AC OPERATION USE MODEL BC-28 ADAPTER/CHARGER. NI-CAD BATTERIES MUST BE INSTALLED. DO NOT USE ON AC WITH NON-RECHARGEABLE BATTERIES.
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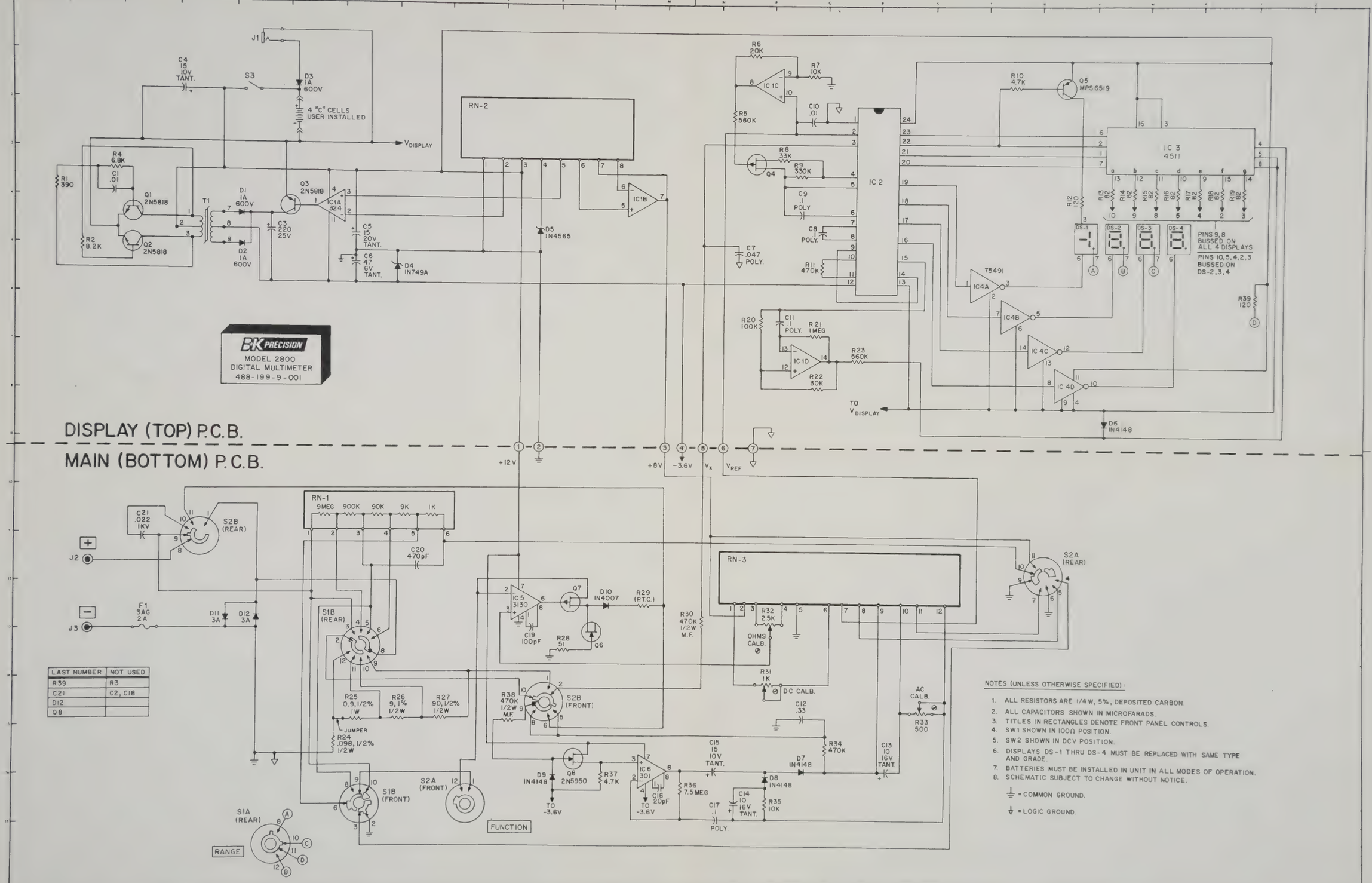
SERIAL NO.
MFG. UNDER U.S. PATENTS
3,051,939 & 3,316,547

Fig. 3. Bottom view.


DISPLAY (TOP) P.C.B.
MAIN (BOTTOM) P.C.B.
B&K PRECISION
MODEL 2800
DIGITAL MULTIMETER
488-199-9-001
J1
S3
C4 15 10V TANT.
D3 1A 600V
4 "C" CELLS USER INSTALLED
V DISPLAY
R1 390
R2 8.2K
R4 6.8K
C1 .01
Q1 2N5818
Q2 2N5818
T1
D1 1A 600V
D2 1A 600V
Q3 2N5818
IC1A 324
C3 220 25V
C5 15 20V TANT.
C6 47 6V TANT.
D4 IN749A
RN-2
IC1B
D5 IN4565
R6 20K
R7 10K
IC 1C
C10 .01
R5 560K
R8 33K
R9 330K
Q4
C9 1 POLY
C8 1 POLY.
R11 470K
C7 .047 POLY.
IC 2
R10 4.7K
Q5 MPS 6519
IC 3 4511
R12 120
R13 82
R14 82
R15 82
R16 82
R17 82
R18 82
R19 82
DS-1
DS-2
DS-3
DS-4
PINS 9,8 BUSSED ON ALL 4 DISPLAYS
PINS 10,5,4,2,3 BUSSED ON DS-2,3,4
7549I
IC4A
IC4B
IC 4C
IC 4D
R39 120
R20 100K
C11 1 POLY.
R21 1MEG
IC 1D
R22 30K
R23 560K
TO V DISPLAY
D6 IN4148
+12V
+8V
-3.6V
Vx
VREF
RN-1
9MEG 900K 90K 9K 1K
C21 .022 1KV
S2B (REAR)
J2
J3
F1 3AG 2A
D11 3A
D12 3A
C20 470pF
S1B (REAR)
IC 5 3130
C19 100pF
Q7
D10 IN4007
R29 (P.T.C.)
R28 51
Q6
R30 470K 1/2W M.F.
RN-3
R32 2.5K
OHMS CALB.
R31 1K
DC CALB.
C12 .33
AC CALB.
R33 500
S2A (REAR)
R25 0.9, 1/2% 1W
R26 9, 1% 1/2W
R27 90, 1/2% 1/2W
JUMPER
R24 .098, 1/2% 1/2W
R38 470K 1/2W M.F.
S2B (FRONT)
Q8 2N5950
D9 IN4148
R37 4.7K
TO -3.6V
IC 6 301
C16 20pF
C15 15 10V TANT.
D7 IN4148
R34 470K
C13 10 16V TANT.
R36 7.5MEG
C14 10 16V TANT.
D8 IN4148
R35 10K
C17 .1 POLY.
S1B (FRONT)
S2A (FRONT)
FUNCTION
S1A (REAR)
RANGE
LAST NUMBER | NOT USED
R39 | R3
C21 | C2, C18
D12 |
Q8 |
NOTES (UNLESS OTHERWISE SPECIFIED):
1. ALL RESISTORS ARE 1/4 W, 5%, DEPOSITED CARBON.
2. ALL CAPACITORS SHOWN IN MICROFARADS.
3. TITLES IN RECTANGLES DENOTE FRONT PANEL CONTROLS.
4. SW1 SHOWN IN 100Ω POSITION.
5. SW2 SHOWN IN DCV POSITION.
6. DISPLAYS DS-1 THRU DS-4 MUST BE REPLACED WITH SAME TYPE AND GRADE.
7. BATTERIES MUST BE INSTALLED IN UNIT IN ALL MODES OF OPERATION.
8. SCHEMATIC SUBJECT TO CHANGE WITHOUT NOTICE.
= COMMON GROUND.
= LOGIC GROUND.

NOTE: Standard value resistors are not listed. Values may be obtained from schematic diagram. Minimum charge $5.00 per invoice. Orders will be shipped C.O.D. unless previous open account arrangements have been made or remittance accompanies order. Advance remittance must cover postage or express charges. Specify serial number when ordering replacement parts.

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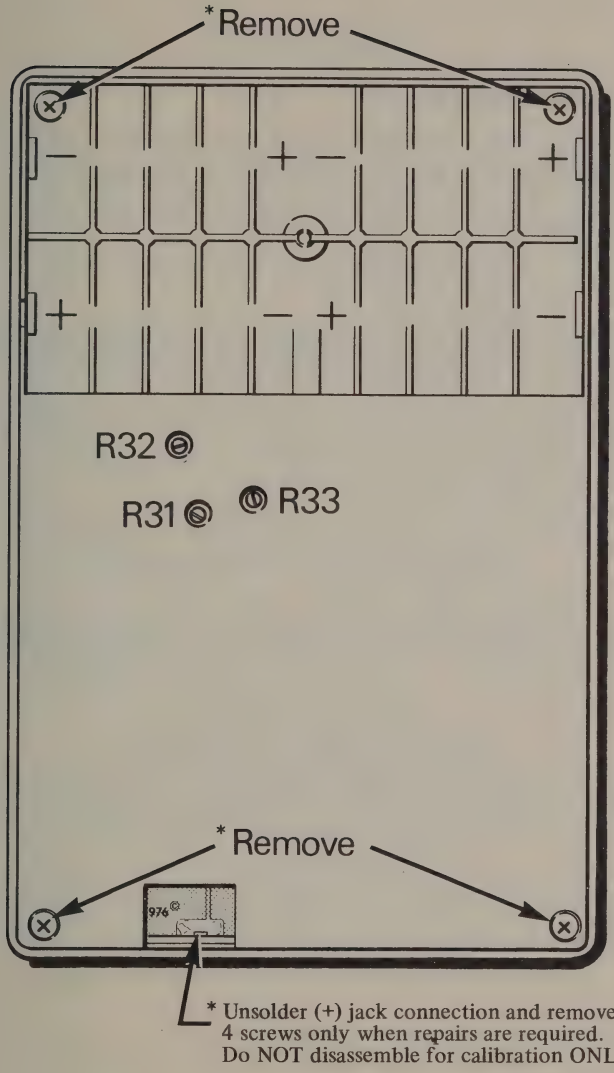

Fig. 4. Location of internal adjustments.

B & K-PRECISION MODEL 2800 PARTS LIST

488-199-9-002

SCHEMATIC SYMBOL	DESCRIPTION	DYNASCAN PART NO.
RESISTORS		
R24	0.098Ω, ½% Preformed Wirewound	004-125-9-001
R25	0.9Ω, 1w, ½% Preformed Wirewound	004-160-9-001
R26	9Ω, ½w, 1% Preformed Metal Film	011-123-9-001
R27	90Ω, ½w, ½% Preformed Metal Film	011-089-9-001
R29	Special, High-Voltage Current Limiter	004-163-9-001
R30, 38	470KΩ, ½w, 5% Preformed Metal Film	011-102-8-474
R31	Trimpot, 1KΩ	008-247-9-001
R32	Trimpot, 2.5KΩ	008-269-9-001
R33	Trimpot, 500Ω	008-266-9-001
NETWORKS		
RN-1	Resistor Network, Input	012-006-9-001
RN-2	Resistor Network	012-013-9-001
RN-3	Resistor Network	012-014-9-001
CAPACITORS		
C1, 10	.01μF, 25V, Pin Lead Disc Ceramic	020-139-9-001
C3	220μF, 25V, +100, −10%, Electrolytic	022-146-9-001
C4, 15	15μF, 10V, 20% P. F. Tantalum	027-009-9-001
C5, C6	15μF, 20V, 20% P. F. Tantalum	027-016-9-001
C7	47μF, 6.3V, 20% P. F. Tantalum	027-013-9-001
C8, 9, 11, 17	.047μF, 100V, 20% P. F. Polyester	025-094-9-001
C8, 9	0.1μF, 100V, 20% P. F. Polyester	025-109-9-001

NOTE: Standard value resistors are not listed. Values may be obtained from schematic diagram. Minimum charge $5.00 per invoice. Orders will be shipped C.O.D. unless previous open account arrangements have been made or remittance accompanies order. Advance remittance must cover postage or express charges. Specify serial number when ordering replacement parts.

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COMPOSITE
499-118-9-001

SCHEMATIC SYMBOL	DESCRIPTION	DYNASCAN PART NO.
CAPACITORS (Continued)		
C12	0.33μF, 100V, 10% P. F. Polyester	025-114-9-001
C13, 14	10μF, 16V, 20% P. F. Tantalum	027-010-9-001
C16	20pF, 500V, 5% P. F. NPO Disc Ceramic	031-039-9-001
C19	100pF, 500V, 10% P. F. Disc Ceramic	020-044-9-001
C20	470pF, 500V, 10% P. F. Disc Ceramic	020-071-9-001
C21	.022μF, 1KV, 20% P. F. Polyester	025-103-9-001
DIODES & TRANSISTORS		
D1, 2, 3	Silicon Diode, 1A, 600V	151-050-9-001
D4	1N749A (4.3V) Zener	152-062-9-001
D5	1N4565 (6.4V) Reference Zener	152-066-9-001
D6, 7, 8, 9	1N4148 Silicon Diode	151-038-9-001
D10	Silicon Diode, 1A, 1KV	151-053-9-001
D11, 12	Protection Diode (Silicon), 3A	151-054-9-001
Q1, 2, 3	2N5818 NPN Silicon Transistor	176-051-9-001
Q4, 7	P Channel FET	182-035-9-001
Q5	MPS 6519 PNP Silicon Transistor	177-015-9-001
Q6	FET (Clamp Diode)	182-036-9-001
Q8	2N5950 FET	182-031-9-001
INTEGRATED CIRCUITS		
IC1	324, Quad Op Amp	307-060-9-001
IC2	CMOS LSI A/D Converter	307-085-9-001
IC3	4511	307-061-9-001
IC4	75491	307-082-9-001
IC5	CA-3130S	307-073-9-001
IC6	301 Op Amp	307-074-9-001
SWITCHES		
S1	Range	083-218-9-001
S2	Function	083-219-9-001
S3	Power, SPDT	084-040-9-001

SCHEMATIC SYMBOL	DESCRIPTION	DYNASCAN PART NO.
MISCELLANEOUS		
DS1, 2, 3, 4	Display, 7-Segment LED	238-006-9-001
F1	Fuse, 3AG, 2A	191-251-3-002
J1	Phone Jack, Sub-miniature	773-059-9-001
T1	Transformer, Switching	064-019-9-001
	Overlay, Front Panel	260-103-9-001
	Logo, Front Panel	260-104-9-001
	Case, Main (Plastic)	271-058-9-001
	Case, Top (Plastic), Assembly	523-184-9-001
	Case, Bottom (Plastic)	271-031-9-001
	Insulator, Vinyl (for J1)	342-030-9-001
	Foot, 7/16" Dia.	380-120-9-001
	7-Lead Jumper	427-019-9-001
	Black Test Lead (Banana to Insulated Clip)	522-062-9-001
	Red Test Lead (Banana to Probe)	522-063-9-001
	Nut For J1	653-018-9-001
	Fuse Cap (Plastic)	742-032-9-001
	Knob, Switch (Function and Range)	751-119-9-001
	Spring, PCB Fuse Contact	767-046-9-001
	Spring, Battery Jumper Contact	769-081-9-001
	Contact, Battery (Single)	769-080-9-001
	Insert, Test Jacks	771-021-9-001
	Insert, Fuse Holder	771-026-9-001

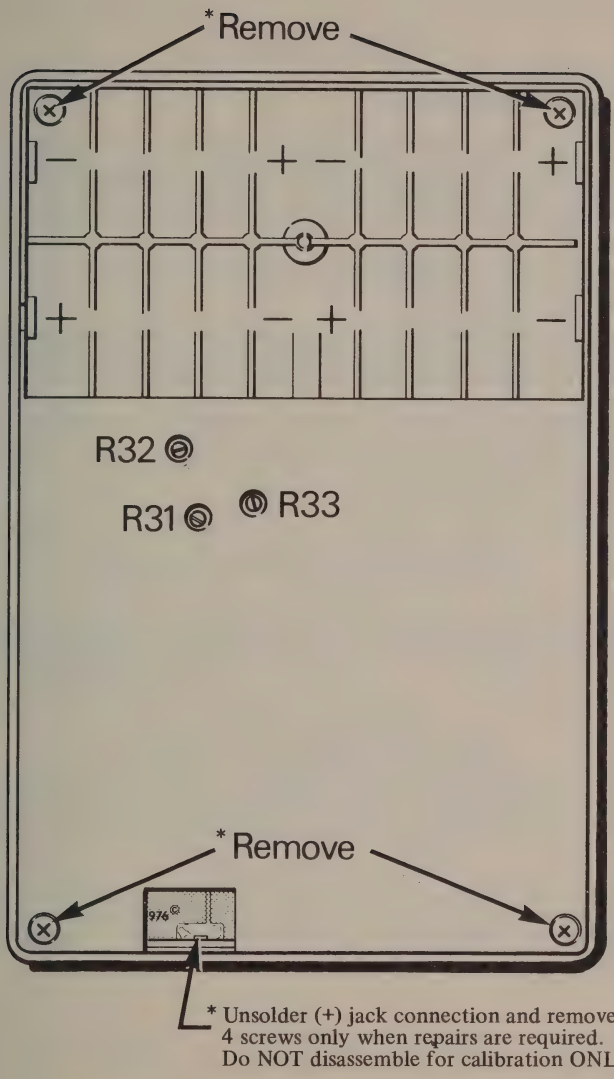

Fig. 4. Location of internal adjustments.

MAINTENANCE

FUSE REPLACEMENT

The protective fuse is located under the plastic cap to the left of minus input jack. To replace fuse, push in and turn the fuse cap counterclockwise and remove the fuse. Replace only with the proper 2A-3AG type fuse. To reassemble, insert new fuse, push in and turn the fuse cap clockwise to the internal stop.

BATTERY REPLACEMENT

Loosen the captive screw in Fig. 3 and remove the back cover. Install or replace the 4 "C" cells with the polarity as shown in the battery holder. Replace the back cover and tighten the captive screw.

Alkaline or Ni-Cad batteries are recommended for this product. If Carbon-Zinc or Alkaline types are used, they should be removed immediately when they test low, to prevent instrument damage from battery leakage.

FLASHLIGHT SIZE "C" BATTERIES

Type	NEDA	Burgess	Eveready	Mallory	RCA	Ray-O-Vac
Zinc-Carbon	14F	1	935	M14F	VS035A	1C
Alkaline	14A	AL1	E93	Mn1400	VS1335	814

RECHARGEABLE BATTERIES

Type	Burgess	Eveready	General Electric	Gould	Gulton
Ni-Cad	CD-14	CH 1.5	GCT 1.5 SB	2.0SC	R-190

If the maintenance and calibration procedures do not restore proper operation, pack the unit securely in its original carton and mail to the nearest **B & K-Precision** authorized service agency. Refer to WARRANTY SERVICE INSTRUCTIONS at the end of manual.

WARRANTY SERVICE INSTRUCTIONS

1. Refer to the MAINTENANCE section of your B & K-Precision instruction manual for adjustments that may be applicable.

2. Defective parts removed from units which are within the One Year Limited Warranty period should be sent PREPAID to the Service Department listed below. Be sure to state the model and serial number of the unit from which the parts were removed and date the unit was purchased. These parts will be exchanged at no charge, under the terms of the Warranty.

3. If the above-mentioned procedures do not correct the problem you are experiencing with your unit, pack it securely (preferably in the original carton or double-packed). Enclose a letter describing the problem and include your name and address. Deliver to, or ship PREPAID (UPS preferred) to the nearest B & K-Precision authorized service agency (see list enclosed with unit).

If your list of authorized B & K-Precision service agencies has been misplaced, contact your local distributor for the name of your nearest service agency, or write to:

Service Department

B & K-Precision Product Group
DYNASCAN CORPORATION
2815 West Irving Park Road
Chicago, Illinois 60618

LIMITED ONE-YEAR WARRANTY

DYNASCAN CORPORATION warrants to the original purchaser that its B & K-PRECISION product, and the component parts thereof, will be free from defects in workmanship and materials for a period of one year from the date of purchase.

DYNASCAN will, without charge, repair or replace, at its option, defective product or component parts upon delivery to an authorized B & K-PRECISION service contractor or the factory service department, accompanied by proof of the date of purchase in the form of a sales receipt.

To obtain warranty coverage, this product must be registered by completing and mailing the enclosed warranty registration card to DYNASCAN, B & K-PRECISION, P.O. Box 35080, Chicago, Illinois 60635 within five (5 days) from the date of purchase.

Exclusions: This warranty does not apply in the event of misuse or abuse of the product or as a result of unauthorized alterations or repairs. It is void if the serial number is altered, defaced or removed.

DYNASCAN shall not be liable for any consequential damages, including without limitation damages resulting from loss of use. Some states do not allow limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty gives you specific rights and you may also have other rights which vary from state to state.

For your convenience we suggest you contact your B & K-PRECISION distributor, who may be authorized to make repairs or can refer you to the nearest service contractor. If warranty service cannot be obtained locally, please send the unit to B & K-PRECISION Service, 2815 West Irving Park Road, Chicago, Illinois 60618, properly packaged to avoid damage in shipment.

DYNASCAN CORPORATION
6460 W. Cortland St., Chicago, Ill. 60635

480-210-9-001